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SYNTHETICS AND AGRICULTURAL SUBSTITUTES IN FOOD AND NONFOOD MARKETS

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Synthetic products and agricultural substitutes are challenging agricultural products in their traditional markets. The fiber, feed, sugar, drying oil, dairy, soap, and animal product markets are faced with increased competition. Synthetic products are derived from nonagricultural materials. These products include urea, saccharin, cyclamates, poromerics, and acrylic fibers. Agricultural substitutes are made, partially or wholly, from one or several agricultural raw materials, and like most synthetics, simulate performance of traditional products. Examples of substitutes include filled milk and bacon-flavored vegetable protein resembling real bacon.

Forces Affecting the Emergence of Synthetics and Substitutes

New processing technologies, expanding consumer incomes, changing consumer preferences and desires, and in some cases lower manufacturing costs and greater product uniformity are all favorable conditions for expanding the number and output of synthetic and substitute food and nonfood products. However, not all of these conditions need be present for every new product.

Processors of agricultural and nonagricultural materials apply new technologies to design new products with added quality, performance, functional properties, and esthetic appeal. In doing so, they expand the variety of products offered, develop new sources of raw materials that lower manufacturing costs, or add desirable product attributes, such as convenience, to consumer products.

Synthetics and Substitutes in Agricultural Commodity Markets

The major agricultural commodity markets in which synthetics and substitutes have made significant inroads are presented in table 15.

The market losses were estimated by computing three trends for the 1957-59 through 1967 period. These were: (1) Total volume of agricultural and synthetic or subetitute products marketed, (2) market volumes of the agricultural product being displaced, and (3) the expected market volume based on the 1957-59 market share relationship. The market loss for the agricultural product in 1967 was assumed to be the difference between the expected trend value and the trend value of actual agricultural marketings. A different base period was used for those markets in which data were not available over the 1957-59 to 1967 period. These markets are noted in the footnotes to table 15.

This procedure probably overestimates losses in some markets because it only partially recognizes the possibility that synthetics and substitutes develop new outlets that expand the total market rather than replace agricultural products. On the other hand, the estimates are for one year only.

Fiber Markets. Synthetic fibers such as nylon, polyester, acrylic, olefins and rayon compete with cotton and wool. The market losses attributable to synthetics in 1967 are estimated at approximately 2.0 billion pounds (88 percent cotton and 12 percent wool) or $632 million (72 percent cotton and 28 percent wool). Cotton's share of the textile market in 1967 had declined to 50 percent, despite absolute increases in the volumes of cotton marketed. Wool's market share declined to 5 percent. The volume of wool marketed has remained at about 513 million pounds annually.

Sugar Markets. Noncaloric saccharin and cyclamates compete with cane and beet sugar for a share of the sweetener market. Market loss for sugar due to these two competitors is estimated at 370,000 tons or $76 million for 1967.

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Table 15.--Estimated loss of traditional agricultural markets to synthetics and agricultural substitutes and total agricultural market, 1967

Agricultural product or market	Unit	Market loss		Estimated total market 1/
		Quantity	Value 1/	
			Mil. dol.	Mil. dol.
Cotton	Mil. lb.	1,780	456	1,124
Wool	Mil. lb.	235	176	385
Cane and beet sugar	Thou. tons	370	76	1,954
Oilseed meal	Thou. tons	358	30	537
Fats and oils for soap 2/	Mil. lb.	460	31	53
Drying oils for paints 3/	Mil. lb.	248	32	64
Glycerine	Mil. lb.	46	7	25
Starch for dextrin for adhesives 4/	Mil. lb.	54	4	43
Soya meal and casein for adhesives 4/	Mil. lb.	76	6	24
Leather for shoe uppers 5/	Mil. sq. ft.	51	31	491
Citrus 6/	Mil. gal.	52	45	334
Fluid milk 7/	Mil. lb.	12	1	3,162
Total			895	8,196

1/ Prices used to compute value were:
Cotton - 25.6 cents per lb.
Wool - 75.0 cents per lb.
Sugar - 10.2 cents per lb.
Oilseed meal - $83.20 per ton
Fats and oils - 6.7 cents per lb.
Drying oils - 12.9 cents per lb.
Glycerine - 16.1 cents per lb.
Starch and dextrin - 7.5 cents per lb.
Soya meal and casein - 7.5 cents per lb.
Leather - 60.0 cents per sq. ft.
Citrus - 85.7 cents per gal.
Fluid milk - $5.43 per cwt.

2/ Fats and oils used in soaps related to total sales of soap and detergents.
3/ Drying oils used in paints related to total paint sales.
4/ Market share relationship existing in 1962 applied to 1967.
5/ Market share relationship existing in 1965 applied to 1967.
6/ The market loss in 1967 is assumed to be equal to synthetic drink sales.
7/ The market loss in 1967 is assumed to be equal to known filled milk sales during November and December 1967. This value is understated since synthetic milk sales and total filled milk sales are not available.

Sugar market loss may be overstated since dextrose from cereal starches also has a share of the total sweetener market and because of the rapid expansion in the diet and health food market. In addition, the sugar market loss may be overstated by the estimating procedure used because the full impact of noncaloric sweetener use did not occur until 1963.

Oilseed Meal Markets. Urea competes with oilseed meals in feeds for cattle and sheep. This oilseed market expanded from 4.5 million tons in 1957-59 to 7.3 million in 1967, or slightly over 62 percent. Over the same period, the use of high-protein meals in ruminant feeds increased from 4.0 million tons to 6.2 million tons, or by 55 percent. Thus, oilseed meals' share of the market declined. Market losses due to reported trends in the use of feed grade urea are estimated at 358,000 tons, or approximately $30 million worth of high-protein meals.

The market loss due to urea probably is much larger than shown here. Labeling of urea as to feed or fertilizer grades does not restrict how it is used. Therefore, some fertilizer grade urea probably is used to formulate feeds. There are no official estimates available on the use of fertilizer grade urea in feeds. However, if urea had been used up to maximum permissible limits (approximately 1/3 of the protein in ruminant rations) approximately 423,000 tons of urea could have been fed in 1966 in contrast to the 180,000 tons of feed grade urea used. There are indications that actual feeding practices are trending toward the upper limit.

Fats and Oils Markets. The uses of animal and vegetable fats and oils in the soap, detergent, and paint markets have declined. The declining use of fats and oils for soaps and detergents is attributable to the rising use of petroleum-derived alcohols, lignin sulfonates, phosphates, and other raw materials. The declining use of drying oils from oilseeds in paints is attributable to the increasing use of tall oil and a change in product formulations to latex emulsion paints, and to alkyds, that often use fatty acids from soybeans, tallow, or tall oil. The estimated 1967 loss in these two markets is 708 million pounds or $63 million.

Glycerine Market. Natural glycerine is produced as a byproduct of the soap-making and fatty-acid industries and competes with a synthetic glycerine manufactured from petroleum raw materials. The declining use of fats and oils in the soap industry adversely affected the production of natural glycerine. Thus, the result has been a market loss of 46 million pounds or slightly more than $7 million for 1967.

Adhesive Markets. Starch, dextrin, soya meals, and casein compete with synthetic resins in the adhesive industry. The use of these agricultural materials has been expanding, but at a lower rate than the use of synthetic materials. Market losses due to synthetics are estimated at 130 million pounds or $10 million for 1967.

Shoe Upper Market. Natural leather competes with poromerics, vinyls, and fabric for a share of the shoe upper market. The market loss attributable to these synthetics is estimated at 51 million square feet or $31 million for 1967.

Citrus Markets. Frozen concentrated, chilled, and canned natural orange juices compete with frozen concentrated and powdered synthetic drinks for a share of the retail fruit beverage market. The 52 million gallons of synthetic drinks sold in this market during 1967 are assumed to be the market loss for natural juices. This represents $45 million for 1967. This loss could be overstated because synthetic drinks may have developed new market outlets.

Dairy Market. Filled milks in which dairy fats are replaced with vegetable fats, and imitation milks using no dairy ingredients, are competing for a share of the fluid milk market. The known volume of filled milk sold in November and December 1967 amounted to 12.3 million pounds. The farm value of these known filled milk sales (based on a Class I price of $5.43 per 100 pounds) was approximately $1 million for these two months.

Implications for Agriculture

Despite market inroads made by synthetics and substitutes, total physical volume of agricultural marketings has expanded since 1957-59. However, the economic effects of increased competition from synthetics and substitutes vary by commodity. Some are being replaced in specific end-uses, marketing of others is expanding at a slower rate than could be expected if replacements were not available and some have been unaffected up to this time.

Synthetics that replace agricultural commodities without expanding the total market represent a direct loss to agriculture. In contrast, substitutes formulated from components of several agricultural commodities may partially replace a traditional commodity without affecting the total volume of agricultural marketings. Substitutes, however, affect the competitive relationships among the various agricultural commodities.

Synthetics and substitutes have had little effect on the market channels for food commodities. This is primarily due to the small number of synthetic foods available and the nature of substitutes. Noncaloric sweeteners are the major synthetic food products now available. Substitutes formulated from accepted agricultural commodities are readily incorporated into food product lines and distributed through established marketing channels or outlets. Examples are filled milk, margarine, and synthetic orange juices. Most synthetic and substitute foods have been developed and marketed by well-established food processing and distribution firms that have sufficient financial resources necessary for the development and promotion of new food products. Future synthetic and substitute foods could be expected to follow a similar pattern.

The development and marketing of new foods will continue to be a major market strategy by food companies for gaining a share of the expanding food market. A majority of these products will likely be substitutes formulated from components of several agricultural commodities and minor amounts of additives such as synthetic flavors, colorings, vitamins, and minerals. Among other things, this allows the manufacturer to incorporate "built-in" services, and to differentiate products from those of competitors. The continued proliferation of food substitutes could further affect conventional food products. Consumer choices may become more complex, competition for retail shelf space will be intensified, and the failure rate of the new substitutes may increase. The development of new foods from synthetic raw materials is expected to be minimal over the next several years.

In nonfoods, the technical and financial capabilities of most manufacturing firms assure a continued stream of synthetic products that compete with agriculture products. In general, these firms use raw materials without regard to origin, if their technical performance is adequate and raw material costs can be lowered.

Agricultural firms processing single commodities for nonfood uses can be expected to decline. An alternative for these types of firms is to adopt multi-product lines and to expand their raw materials requirements to include synthetic materials.

The introduction of synthetic materials may extend the marketing channel for agricultural products used for nonfood purposes. This will be due to the added processing required for agricultural products to successfully compete on a technical requirements basis with the synthetic. Some examples are fiber blending, chemical modification of drying oils and greater trim and shaping of hides for leather.

Several other changes can be anticipated if synthetics and substitutes capture a substantial share of all markets supplied by traditional agricultural products. Examples of such changes are accelerated obsolesence of agricultural processing plants, shifts in plant location, changes in interregional competition, and shifts in agricultural production input requirements. However, only selected markets have been eroded by synthetics and substitutes. Agricultural producers, processors, and marketers have partially adjusted to the new market environment.